

FDOT Research Quarterly Summary, February 2021

Completed FDOT Research, October 2020 – January 2021

- [Geotechnical](#)
- [Maintenance](#)
- [Planning](#)
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- [Traffic Engineering and Operations](#)

Newly Funded FDOT Research, October 2020 – January 2021

- [Materials](#)
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Completed FDOT Research, October 2020 – January 2021

[FDOT Geotechnical Office](#)

• **Load and Resistance Factors Design (LRFD) Resistance Factors for Tip Grouted Drilled Shafts**

University of South Florida researchers derived load and resistance factor design (LRFD) soil resistance factors that designers can use when drilled shafts are post-grouted. This was accomplished through field data collection, load test data analysis and reduction, and comprehensive statistical analysis.

Project number: BDV25-977-37

Principal investigator: Gray Mullins, University of South Florida

Project manager: Juan Castellanos, FDOT Geotechnical Office

[\[Read the Project Summary\]](#) [\[Read the Final Report\]](#)

• **Geo-Statistical Deep Foundation Design Software**

University of Florida researchers modified previously developed software for the computation of pile or drilled shaft axial resistance to accept the results of geotechnical investigation of a specific site, performing both spatial variability analysis and method error estimation.

Project number: BDV31-977-108

Principal investigator: Michael Davidson, University of Florida

Project manager: Rodrigo Herrera, FDOT Geotechnical Office

[\[Read the Project Summary\]](#) [\[Read the Final Report\]](#)

• **Bearing Capacity Factors for Shallow Foundations Subject to Combined Lateral and Axial Loading**

University of Florida researchers collected D_{td} on current width to length, embedment, eccentricity, lateral vs, axial load combination, and sand densities beneath shallow foundations in Florida. They determined an foundation with typical qualities for laboratory and field test. Centrifuge tests under a variety of conditions were compared against measured centrifuge results with current American Association of State Highway and Transportation Officials (AASHTO) bearing equations as well as European and Australian approaches to identify which combination of bearing combination factors are representative and recommended for Florida Department of Transportation (FDOT) use.

Project number: BDV31-977-66

Principal investigator: Michael McVay, University of Florida

Project manager: Larry Jones, FDOT Geotechnical Office

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[FDOT Maintenance Office](#)

- **Clear Recovery Zone Vegetation Requirements, and Review of Current Tree Pruning and Maintenance Practices for Landscape, Urban and Rural Areas within the Right of Way**

University of Florida researchers reviewed policy, procedure, clear zone vegetation criteria guide, and the Maintenance Guide Handbook for tree maintenance and pruning, and make recommendations on improvements to these guides based on an assessment of past Florida Department of Transportation (FDOT) plantings. The statewide Maintenance Guide Handbook on tree maintenance and pruning was revised to include a section on rural roadway tree pruning. The researchers developed and conducted a half-day technology transfer program (with associated supporting materials) at four locations to disseminate research results and introduce the information in the new handbook.

Project number: BDV31-977-75

Principal investigator: Andrew Koeser, University of Florida

Project manager: Jon Heller, FDOT Maintenance Office

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[FDOT Planning Office](#)

- **The Impacts of Emerging Mobility Options and Vehicle Technologies on Travel Behavior**

Florida International University researchers explored advanced modeling techniques, including econometric models, such as random parameter logit models and interaction effects to identify sources of user heterogeneity, and machine learning methods, such as cluster analysis and principal component analysis, and identify modeling approach that best fits the study purpose; They will also develop models to address various influential factors, such as user heterogeneity, demographic characteristics, mobility habits, personal preferences and attitudes, willingness to

pay, and the interaction effects among them. The researchers will recommend approaches to incorporate considerations for ACES in the existing modeling framework.

Project number: BDV29-977-47

Principal investigator: Xia Jin, Florida International University

Project manager: Terry Corkery, FDOT Planning Office

[\[Read the Project Summary\]](#) [\[Read the Final Report\]](#)

- **Identification of Tourist Flows in Florida to Support Development of Tourist Travel Module for FDOT Florida Transportation Model**

To enable the Florida Department of Transportation (FDOT) to better monitor and forecast traffic flow, University of Florida researchers evaluated alternative strategies for improving highway accessibility to potential and existing tourism products, evaluated potential strategies for improving visitor experiences as they travel through the state, and forecasted problems or conflicts created by tourists and Florida residents. The goal is to overcome limitations in the Florida Statewide Model (FLSWM) regarding tourist-oriented traffic flow, crashes, potential revenue, and maintenance considerations.

Project number: BDV31-977-118

Principal investigator: Andrei Kirilenko, University of Florida

Project manager: Thomas Hill, FDOT Planning Office

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[FDOT Public Transportation Office](#)

- **Florida Airport Sustainability Tracking/Monitoring System**

Based on the outcomes of Airport Cooperative Research Program (ACRP) and National Cooperative Highway Research Program (NCHRP) studies in related areas, University of South Florida researchers, explored the unique needs of Florida's airport system and produced a Florida Airport Sustainability Performance Tracking/Monitoring System that can be easily used by airport sponsors and related transportation agencies.

Project number: BDV25-977-39

Principal investigator: Yu Zhang, University of South Florida

Project manager: Michael McClure, FDOT Public Transportation Office

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[FDOT Traffic Engineering and Operations Office](#)

- **I-STREET Initiative: Evaluation of Intelligent School Zone Beacon and Vehicle-Cyclist Detection and Warning System**

In order to alert the distracted drivers of speeding in a school zone, several different approaches have emerged including engineering, education and enforcement. One of technological solution includes using GPS and cell phone technology that can send an alert or warning message on the driver's cell phone if the driver of the vehicles does not reduce the speed of the vehicle in a school zone.

University of Florida researchers evaluated the safety performance of this category of technological solution. A secondary benefit of the same application was the potential to alert the driver if there is a cyclist in the vicinity. The second objective was to evaluate the safety performance of vehicle-cyclist alert application.

Project number: BDV31-977-103

Principal investigator: Siva Srinivasan and Eakta Jain, University of Florida

Project manager: Raj Ponnaluri, FDOT Traffic Engineering and Operations Office

[\[Read the Project Summary\]](#) [\[Read the Final Report\]](#)

- **Timely, Dynamic, and Spatially Accurate Roadway Incident Information to Support Real-Time Management of Traffic Operations**

University of Florida Transportation Institute (UFTI) researchers developed a much more in-depth understanding of current roadway incident information management at the district level, including over 80 law enforcement agencies and their computer-aided dispatch (CAD) and 911 systems. The research team conducted a feasibility analysis and provided recommendations to develop a real-time, unified, consistent, accurately geolocated, and dynamically updated information stream of district-wide roadway incidents to support the district's traffic operations mission.

Project number: BDV31-977-111

Principal investigator: Ilir Bejleri, University of Florida Transportation Institute

Project manager: Jeremy Dilmore, FDOT Traffic Engineering and Operations Office

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Newly Funded FDOT Research, October 2020 – January 2021

[FDOT Materials Office](#)

- **Peak Temperature Determination of Drilled Shafts Excluded from Mass Concrete Consideration in Current Specifications**

University of South Florida researchers will obtain field temperature data from drilled shafts suspected to exceed present temperature limits to evaluate the current practices and propose modifications to the Standard Specification to increase durability and structural longevity of drilled shafts. The second objective is to develop a Florida Method that specifies the materials and procedures required to instrument and record the temperature profiles of the core and

surface of a drilled shaft as it cures. Included within this method or in a separate Florida Method, equipment and procedures to estimate drilled shaft core temperature from thermal integrity testing will be detailed.

Project number: BDV25 977-75

Principal investigator: Gray Mullins, University of South Florida

Project manager: Patrick Upshaw, FDOT Materials Office

[\[TRB Research in Progress entry\]](#)

- **Improved Resilience of Asphalt Pavements Due to Flooding**

University of Florida researchers will determine implementable, cost-effective methods to improve the resilience of asphalt pavements under flooded conditions. This primary objective can be broken down into two detailed objectives: (1) Evaluate the resilience of an asphalt mixture that is loaded while inundated with water; and (2) Improve asphalt mixture properties to resist the impacts of flooding.

Project number: BDV31 977-137

Principal investigator: Jian Zou, University of Florida

Project manager: Greg Sholar, FDOT Materials Office

[\[TRB Research in Progress entry\]](#)

[FDOT Planning Office](#)

- **Crashes Related to Type and Location of Driveway Access**

University of South Florida researchers will develop additional research-based insight into how driveway design and location impact vehicular, bicycle, and pedestrian safety. The research team will evaluate the impact of driveway type and location along major roadway corridors and in the vicinity of interchanges on vehicular, and bicycle- and pedestrian-involved crashes. This will include issues such as the types of turning movements allowed (e.g., right in /right out, right-in only, right-out only, left in only, left out only, and full access), other design characteristics (e.g., spacing, turn lane length, functional area/corner clearance, speed, location of sidewalk, etc.) and driveway volumes. A related objective is to translate the findings into guidance that will help planners and engineers achieve a significant reduction in fatalities and serious injuries on public roads for all roadway users. The study will identify any need for changes to the access management guidance provided to the FDOT districts for access permit applications to ensure improved safety outcomes for all travel modes in commercial driveway access permitting and mitigation decisions. The researchers will also assess whether additional guidance is needed for review of requests for new or modified interchanges and for interchange area access management planning.

Project number: BDV25 977-76

Principal investigator: Kristine Williams, University of South Florida

Project manager: Gina Bonyani, FDOT Planning Office

[\[TRB Research in Progress entry\]](#)

[FDOT Structures Office](#)

- **Synthesis Study Quantifying the Effect of UHPC Fiber Dispersion and Orientation in Structural Members**

Ultra-high performance concrete (UHPC) design codes from other countries include reduction factors based on UHPC placement and fiber orientation for full-scale specimens. Florida State University researchers will synthesize the scientific literature to understand those factors and what research studies or rationale they are based upon. This research will also document the work which has been done thus far to understand the effect fiber orientation has on the mechanical properties of UHPC at a material level.

Project number: BDV30 977-34

Principal investigator: Qian Zhang, Florida State University

Project manager: Christina Freeman, FDOT Structures Office

[\[TRB Research in Progress entry\]](#)

[FDOT Traffic Engineering and Operations Office](#)

- **Study of Operational and Safety Impacts of Disabled and Abandoned Vehicles on FDOT Roadways**

University of Central Florida researchers seek to enhance and increase safety on Florida Department of Transportation (FDOT) roadways by evaluating the operational and safety impacts of disabled and abandoned vehicles (DAVs) on FDOT limited access roadways, particularly vehicles that are stopped, disabled, or parked on roadway shoulders. They will identify and evaluate methods to reduce these impacts and estimate the benefits and costs of these methods. Impacts include injuries and fatalities of travelers due to crashes associated with these vehicles; congestion-related delays impacting commerce, productivity, and quality of life; and resources spent by traffic management centers (TMCs) and responders handling disabled and abandoned vehicles. The impacts of abandoned crashed vehicles and making-own-arrangements (MOA) tows will also be considered. Various strategies to reduce the frequency of DAVs and their impacts will be studied and evaluated, including improvements to existing notification methods and response procedures, as well as new methods that could improve the handling of DAV events.

Project number: BDV24 977-37

Principal investigator: Haitham Al, University of Central Florida

Project manager: Eric Gordin, FDOT Traffic Engineering and Operations Office

[\[TRB Research in Progress entry\]](#)

- **USF-CUTR I-4 FRAME Project Before Study: Data Collection and Analysis of Safety and Mobility Conditions Prior to Implementation**

University of South Florida researchers will identify all relevant applications for Interstate 4 (I-4) Florida's Regional Advanced Mobility Elements (FRAME) along with the data to be collected for each application. The research team will consider a comprehensive performance measurement framework for the use cases identified. The research team will also provide a comprehensive evaluation of the "before" conditions for the study area.

Project number: BDV25 977-77

Principal investigator: Sung Lin, University of South Florida

Project manager: Raj Ponnaluri, FDOT Traffic Engineering and Operations Office

[\[TRB Research in Progress entry\]](#)

- **Guidelines for Activating Ramp Meters During Off-peak Hours and Weekends**

Florida International University researchers will develop specific guidelines and criteria to activate ramp meters during off-peak hours and on weekends in response to non-recurring congestion. The proposed guidelines will enable District Six to use ramp metering to improve traffic operations and safety during off-peak hours and on weekends. The study results and the developed tool could be leveraged across Florida, where ramp metering will be employed.

Project number: BDV29 977-62

Principal investigator: Priyanka Alluri, Florida International University

Project manager: Alejandro Motta, FDOT Traffic Engineering and Operations Office

[\[TRB Research in Progress entry\]](#)

- **Environment for Testing and Assessing Infrastructure Support of Connected Vehicle and Cooperative Highway Automation Applications**

Florida International University researchers will identify the impacts of cooperative driving automation (CDA) on system performance and achieving Florida Department of Transportation (FDOT) Transportation Systems Management & Operations (TSM&O) strategic plan goals. They will also identify the needed actions and capabilities of the FDOT to enhance CDA impacts. Specific objectives are (1) developing a concept of operations and an action plan for the incorporation of CDA features as part of the FDOT TSM&O processes and for the support of the traffic management centers and roadsides of CDA, (2) developing methods for testing and evaluating infrastructure support of CDA in a microscopic simulation and controlled real-world test environment, and (3) identifying the needs for work force development and for supporting the training of FDOT staff on the TSM&O activities associated with CDA.

Project number: BDV29 977-63

Principal investigator: Mohammed Hadi, Florida International University

Project manager: Raj Ponnaluri, FDOT Traffic Engineering and Operations Office

[\[TRB Research in Progress entry\]](#)

- **Performance Evaluation of Connected Vehicle (CV) and Transportation Systems Management and Operations (TSM&O) Projects in Florida**

Florida International University researchers will assist the Florida Department of Transportation (FDOT) in developing approaches to evaluate the performance of connected vehicle (CV) projects and the RISC, RRSP, and SWZ Transportation Systems Management and Operations (TSM&O) strategies. Specific objectives include (1) identifying and recommending both qualitative and quantitative performance metrics that could be used to estimate the benefit-cost (B/C) ratio and return on investment (ROI) in deploying CV initiatives and (2) develop a framework for benefit-cost analysis of RISC and RRSP programs, and SWZ technologies.

Project number: BDV29-977-64

Principal investigator: Priyanka Alluri, Florida International University

Project manager: Raj Ponnaluri, FDOT Traffic Engineering and Operations Office

[\[TRB Research in Progress entry\]](#)